

REMARKS

Please reconsider this application in view of the claim amendments made above and the following remarks. Further, the Applicant thanks the Examiner for the courtesies extended in the telephone interview of April 18, 2002.

I. Amendments to the Specification

The amendments to the Specification have been made to correct minor typographical errors discovered by the Examiner. No new matter has been added by way of these amendments.

II. Disposition of Claims

Claims 1 and 4-7 are currently pending in the application. Claims 1 and 4 have been amended to clarify the scope of the Applicant's invention. No new matter has been added by way of the amendments. Support for amended Formula 1 may be found, for example, on page 3 of Applicant's originally filed specification.

III. Claim Objections

The Examiner objected to claim 1 because the claim contained an extraneous period. The period has been deleted. The Examiner objected to claim 5 as being in improper dependent form because it failed to limit the subject matter of a previous claim. Claim 5 has been amended to depend from claim 1, rather than claim 4. In light of these amendments, withdrawal of the Examiner's objections is respectfully requested.

IV. Rejections Under 35 U.S.C. § 112

The Applicant's invention relates to a highly permeable composite reverse osmosis membrane, which may be crosslinked. In one embodiment, a polymer having a side chain

including a primary amino group is used. A polyfunctional acid halide can be added to the polymer, resulting in a chemical bond forming between the acid halide and the primary amine. As a result of this, the polymer chains become chemically entangled. In one embodiment, the amine compound has a formula as illustrated by Formula 4 on page 7 of the Specification. Notably, the values of a, b, and c described by that formula merely represent the ratios of starting monomer used, and are not meant to represent a specific monomer sequence of 518 units.

The Examiner rejected claim 1, in numbered paragraph 5 of the Office Action, under 35 U.S.C. § 112, ¶ 1. Specifically, the Examiner objected to the preliminary amendment filed by the Applicant as attempting to enter "new matter" into claim 1. The Examiner first objected to the range " $2 \leq a$ " as not being supported by the original specification. This amendment was made in response to the rejection made by the Examiner in the parent application, in which the Examiner noted that while the preamble of claim 1 recited "a main chain of *polyvinyl* alcohol," when a had "a" value of 1, there was no main chain of polyvinyl alcohol.

Accordingly, the Applicant has now returned the range for the "a" component to " $0 < a$ " and removed the language reciting a "main chain of polyvinyl alcohol" from claim 1. The " $0 < a$ " range is supported by the specification as originally filed. Withdrawal of the § 112 rejection of claim 1 on this ground is requested.

In numbered paragraph 5, note b, the Examiner objected to R^3 being anything other than NH_2 . The Applicant has amended claim 1 to recite " R^3 is NH_2 ." Accordingly, withdrawal of the § 112 rejection of claim 1 on this ground is requested.

In numbered paragraph 5, note c, the Examiner objected to the "use of the subscripts a, b, and c to designate relative amounts of monomeric units in any order . . . [to be] new matter." (Office Action at 3). The Applicant respectfully requests reconsideration of this objection.

In support of the Applicant's argument, the Applicant submitted an affidavit under 37 C.F.R. § 1.132. The affidavit stated that "[t]herefore, one skilled in the art would know that the formulae in the application could not mean polymers with the specific sequences shown. Instead, one skilled in the art would know that these formulae simply indicate the relative ratios of starting monomers." In addition to this affidavit, the Applicant's specification lists several Japanese patent applications which disclose forming membranes containing polyamide.

The appropriate legal standard for reviewing the specification is whether one of ordinary skill in the art could make or use the claimed invention without performing "undue experimentation." The Applicant believes that the affidavit sets forth that one of ordinary skill of the art, having knowledge of interfacial polymerization techniques used in this field, and knowledge of the starting monomer ratios, could make a reverse composite membrane within the scope of claim 1.

Further, the Applicant objects to the Examiner's reliance on the fact that long sequence-specific polymers have been synthesized in the case of proteins and DNA. The Applicant notes that those of ordinary skill in the field of reverse osmosis membrane techniques would appreciate that the techniques used in protein or DNA syntheses cannot be used to prepare polymers with carbon-carbon linkages. The polymers used in the instant invention are linked by carbon-carbon bonds, not amide or phosphoester bonds. Further, when making this type of determination, the

specification must be viewed *at the time of filing* rather than looking to the future of polymer science.

Withdrawal of this rejection is respectfully requested in light of the affidavit filed by the Applicant, which is evidence of the knowledge of one of ordinary skill in the art.

In addition, the Examiner further rejected claims 1 and 4-7 under 35 U.S.C. § 112, ¶ 1 as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to make and/or use the invention for several specific reasons.

First, in numbered paragraph 6, part a, the Examiner stated that the example provided in the specification could not be understood. The Examiner noted that the example referenced Formula 5, which does not exist. The applicant believes that it would be clear to one of ordinary skill in the art that the "polyvinyl alcohol-based amine compound having a side chain amino group . . ." refers to Figure 4, which is shown in the same paragraph. Further, in the same paragraph, the Examiner notes that an aqueous solution of "sodium hydrocarbon" is listed. This is a mere typographical error.

On page 6, the specification states that "[t]he [monomer containing solution] can further contain a surfactant such as . . . sodium laurylsulfonate. Such a surfactant has an effect for improving the wettability of the polar solvent solution including the amine component for the microporous support. Furthermore, for accelerating the polycondensation reaction at the interface it is effective to use sodium hydroxide or sodium tertiary phosphate capable of removing a hydrogen halide formed by the interfacial reaction . . . as a catalyst."

In light of this paragraph, which describes the use of sodium hydroxide as a catalyst for the reaction discussed in example 1, the Applicant believes the Examiner's rejection of "sodium hydrocarbon" to be improper. Finally, the Examiner stated that "one would not know the molecular weight of the polymer to be used" because only relative amounts of monomers are provided. The Applicant again believes that one of ordinary skill in the art would be aware of the typical molecular weight ranges required for reverse osmosis composite membranes and, accordingly, undue experimentation would not be needed. For at least these reasons, withdrawal of the rejections in numbered paragraph 6, part a, is respectfully requested.

In numbered paragraph 6, part b, the Examiner stated that example 1 was not "within the scope of claim 1." The Applicant respectfully disagrees with this statement. First, the Examiner stated that $y = 0$ in the example. However, claim 1 also notes that y may be equal to 0. Withdrawal of this rejection is respectfully requested.

Second, the Examiner stated that R^3 is not a primary amine in the example. Claim 1 has been amended to recite that R^3 is NH_2 . Accordingly, withdrawal of this rejection is respectfully requested. Third, the Examiner stated that R^1 is not "selected from the group consisting of" Claim 1 has been amended to recite that $C-R^1-C$ is selected from the group, rather than R^2 by itself. Accordingly, the Applicant believes that $C-R^1-C$ now represents the ether group, alkylene group, or ester group required by claim 1. For at least these reasons, withdrawal of the rejections in numbered paragraph 6, part b, is respectfully requested.

In numbered paragraph 6, part c, the Examiner asserts that the statement "an amine component comprising at least . . ." is confusing and would not be understood by one of ordinary skill in the art. To the extent that the Applicant understands the Examiner to be objecting to a

phrase in claim 1, the phrase "having a main chain of polyvinyl alcohol and a side chain comprising at least one amino group selected from the group consisting of primary amines" has been deleted from claim 1. Therefore, withdrawal of this rejection is respectfully requested.

The Examiner further rejected claims 1 and 4-7 under 35 U.S.C. § 112, ¶ 2 as being indefinite. In numbered paragraph 9, the Examiner states that the phrase "at least one amino group . . ." and R^3 is a primary amine because amino group and primary amine are "mutually exclusive terms." The Applicant has deleted the former from claim 1. Accordingly, withdrawal of this rejection is respectfully requested.

In numbered paragraph 10, the Examiner stated that the meaning of R^1 is unclear. The Applicant has amended the scope of claim 1 to recite C- R^1 -C (rather than simply R^1) is selected from the group consisting of an ether group, an alkylene group, and an ester group. This corresponds to the suggestion made by the Examiner during the telephone interview and is believed to clarify this point. The Applicant thanks the Examiner for the suggestion.

Finally, in numbered paragraph 11, the Examiner stated his confusion over whether or not a, b, and c refer to relative amounts of monomeric units or not. The Applicant reasserts that the arguments made above (and the affidavit) provide clarification with respect to this point.

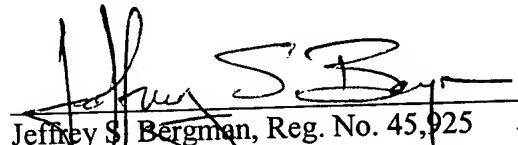
V. Conclusion

The Applicant believes this application to be patentable over the prior art, and respectfully requests favorable action in the form of a Notice of Allowance.

Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference No. 04558.035002).

Respectfully Submitted,

Date: 4/30


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APPENDIX A: MARKED-UP COPY OF THE SPECIFICATION

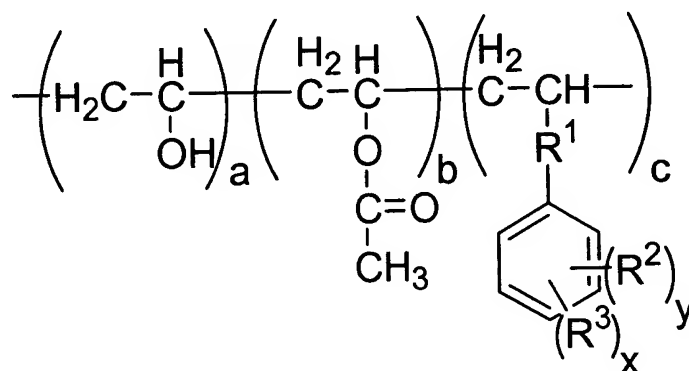
Please amend the paragraph starting on line 18 of page 7 as follows:

(Amended Twice) An aqueous solution including 2 weight % of polyvinyl alcohol-based amine compound having a side chain amino group represented by Formula 4, 0.5 weight % of sodium lauryl sulfate and 0.5 weight % of sodium hydro[carbon]xide was applied on a polysulfone-based [ultrafilterartion] ultrafiltration membrane (microporous support) before removing extra aqueous solution, so that a layer of the aqueous solution was formed on the support:

APPENDIX B: MARKED-UP COPY OF THE CLAIMS CLAIMS

1. (Twice Amended) A highly permeable composite reverse osmosis membrane comprising a thin film and a microporous support to support the thin film;
 wherein the thin film is formed by reacting a (a) component with a (b) component, the (a) component, as represented by Formula 1[, **having a main chain of polyvinyl alcohol and a side chain comprising at least one amino group selected from the group consisting of primary amines**]; and the (b) component comprising at least one substantially monomeric compound having at least two groups that react with the amino groups[.]

Formula 1



wherein $0 \leq [2 \leq] a$, $0 \leq b$, $2 < c$, $1 \leq x \leq 5$, $0 \leq y \leq 4$, $\text{C}-\text{R}^1-\text{C}$ is at least one group selected from the group consisting of an ether group, an alkylene group, and an ester group; R^2 is at least one group selected from the group consisting of an alkyl group and a halogen group; and R^3 is [a **primary amine**] NH_2 .

5. (Twice Amended) The highly permeable composite reverse osmosis membrane according to claim [4] 1, wherein the (b) component is at least one polyfunctional acid chloride compound selected from the group consisting of aromatic, aliphatic, and alicyclic polyfunctional acid halide compounds.